

1 Improved container

2

3 Field of the Invention

4

5 The present invention relates to containers for  
6 transporting plants and in particular, but not  
7 exclusively, the invention relates to an easily assembled  
8 container with a join adapted to allow access to inspect  
9 the root ball of a plant within the container.

10

11 Background of the Invention

12

13 It is well known in the art to provide plant containers  
14 in which the side walls and base have holes or apertures  
15 which permit air to circulate around the container. This  
16 feature facilitates air pruning of the roots as the root  
17 structure expands by virtue of the plant growing in the  
18 container.

19

20 Such a plant growth container and air pruning feature is  
21 that disclosed in US Patent 5,099,607 to Lawton PA. This  
22 Patent discloses a container in which plants are to be  
23 grown and comprises of a flexible rectangular section of

1 material moulded into a lattice of recesses and  
2 corresponding protuberances. The section is formed into a  
3 cylinder with the vertical edges of the section  
4 overlapping so that opposite recesses and protuberances  
5 form a nesting arrangement which is then fastened  
6 together to produce the container. Roots are guided into  
7 the recesses which converge to holes providing the air  
8 interface for air pruning to take place. This plant  
9 growth container has the advantages of being easily  
10 adaptable in diameter and is reusable.

11

12 A similar plant growth container is also disclosed in US  
13 Patent 4,939,865 to Whitcomb et al. This Patent describes  
14 a container comprising a set of upwardly extending  
15 removably joined side panels having a lattice of  
16 protuberances and corresponding recesses converging to  
17 holes. The panels are generally rectangular, bendable and  
18 have vertical edge joints so that one or more of the side  
19 panels can be joined together to form a generally  
20 cylindrical open-topped container. Like the container of  
21 US 5,099,607 this container has the advantages of being  
22 easily adaptable in diameter and is reusable.

23

24 These open topped containers have a number of common  
25 disadvantages. As the joints of these containers are on  
26 the vertical, it is difficult for a user to peel back a  
27 section of the section or panel to inspect the root ball  
28 of a plant within.

29

30 A further disadvantage is in the strength of the  
31 container. These containers are generally constructed of  
32 a lightweight material which has the flexibility to bend  
33 into the cylindrical form easily. As such, this

1 compromises the weight of the contents i.e. soil and  
2 trees or plants, which can safely be transported.  
3 Further, when used with a base, the base has a tendency  
4 to collapse inwards under the weight of the plant which  
5 is placed in the container. The problem is exacerbated  
6 for large diameter containers due to the relatively small  
7 surface area of support given to the base and the fact  
8 that the base rests on a downwardly slopping surface  
9 within the container. Thus a great number of bases must  
10 be manufactured to provide for each possible diameter  
11 size due to the fact that the diameter of the base must  
12 be a close match to the diameter of the container.

13

14 A yet further disadvantage of this open topped container  
15 is that current formers used to make the sections are  
16 flat topped formers. These produce a flat surface that  
17 deflects the roots back as opposed to guiding them gently  
18 towards the air interface.

19

#### 20 Summary of the Invention

21

22 It is an object of the present invention to provide a  
23 container for an improved plant root container which can  
24 be manufactured in simple pieces and assembled easily.

25

26 It is a further object of the present invention to  
27 provide an improved plant root container which obviates  
28 or mitigates at least some of the disadvantages of prior  
29 art plant root containers.

30

31 It is a further object of the present invention to  
32 provide an improved plant root container which provides a  
33 join adapted to allow access to inspect the root ball of  
34 a plant within the container.

1  
2 According to a first aspect of the present invention,  
3 there is provided a plant container, the container  
4 comprising at least one section of flexible material, the  
5 material having an inner and an outer surface, said inner  
6 surface being formed at least in part by a lattice of  
7 recesses, at least some of said recesses converging  
8 towards a hole through the material, said outer surface  
9 being formed at least in part by a lattice of  
10 protuberances at the same relative positional arrangement  
11 as the recesses, wherein said section is formed as a  
12 parallelogram having two acute angles and two obtuse  
13 angles, the one or more sections being arranged to form a  
14 cylinder with adjacent ends overlapping and the  
15 protuberances on the outer surface of one end nesting  
16 within the recesses of the inner surface of the adjacent  
17 end at the overlap.

18  
19 This arrangement provides a diagonal join, extending  
20 partly around the cylinder. An upper portion of an end  
21 i.e. that part including an acute angle of the  
22 parallelogram, can be 'peeled back'. This allows  
23 inspection of the contents of the container or allows the  
24 contents to be removed, without the container collapsing,  
25 as the ends towards a base of the container remain in the  
26 overlapped configuration.

27  
28 Preferably the acute angles are in the range 30 to 60  
29 degrees. Advantageously, the acute angles are at 45  
30 degrees.

31  
32 Preferably the container includes one or more fastening  
33 means provided to hold the section in said overlapping,  
34 nested engagement. Preferably there are at least two

1 fastening means arranged on the overlap. This allows a  
2 top fastening means to be released to 'peel back' the  
3 material for inspection, while still securing the bottom  
4 of the cylinder around the contents. Preferably the  
5 fastening means is by screws located through the holes  
6 formed in the recesses. Alternatively, fastening means  
7 may be a clip or other arrangement attached to the  
8 overlapping portion of the section.

9  
10 Preferably the section has a length greater than its  
11 width. Preferably at least some of said recesses are of a  
12 substantially truncated conical form. Optionally, each  
13 recess comprises a wall which converges towards the hole,  
14 adjacent walls forming a peak between each recess,  
15 wherein a plurality of said peaks are located on a row  
16 lengthways on the inner surface having a height greater  
17 than that of adjacent peaks across the width of the inner  
18 surface. This arrangement provides a ledge or support  
19 within the container.

20  
21 Preferably the container further comprises a base.  
22 Advantageously the base is arranged to rest on said walls  
23 of said peaks of greater height.

24  
25 Preferably, each base of the recesses and each apex of  
26 the protuberances forms a point. This ensures that flat  
27 surfaces inside the container are kept to a minimum which  
28 reduces the number of roots deflected back into the root  
29 ball and ensures the roots are guided gently towards the  
30 holes where they contact the air interface and are  
31 pruned.

32  
33 Preferably the holes within the recesses are of various  
34 diameters over the width of the section.

1  
2 Advantageously, at a position in the container where no  
3 growing medium is adjacent the inside wall, typically at  
4 the top of the container, one or more rows of recesses  
5 have no holes. By not incorporating holes at the top of  
6 the container, this allows for the container to hold  
7 water when the plant is watered.  
8  
9 At positions where the growing medium is adjacent the  
10 inner surface, the recesses may have medium sized holes.  
11 Medium sized holes are defined as apertures which remove  
12 6%-20% of the area at the base of a recess. The  
13 percentage being dependent on the species of plant being  
14 housed in the container.  
15  
16 Advantageously, recesses below the base may have large  
17 holes. Large sized holes are defined as apertures which  
18 remove 20%-40% of the area at the base of a recess. The  
19 holes below the base increase the amount of air  
20 circulation to aid air root pruning.  
21  
22 Advantageously also, protuberances may also have holes at  
23 their apex. This 'double holing' further increases air  
24 circulation and is preferably located under the base.  
25  
26 Preferably the material is formed from a relatively thin  
27 sheet of plastic material and the said recesses in said  
28 inner surface produces said protuberances in said outer  
29 surface.  
30  
31 Preferably the container is made of a plastic. More  
32 preferably the plastic is chosen to be easily moulded on  
33 a former. The plastic may be a recycled plastic such as  
34 HDPE obtained from domestic waste. Advantageously a

1 pigment may be added to the plastic to colour the  
2 plastic. Preferably the plastic is dyed black.

3

4 According to a second aspect of the present invention,  
5 there is provided a section of material for forming a  
6 container, the material having an inner and an outer  
7 surface, said inner surface being formed at least in part  
8 by a lattice of recesses, at least some of said recesses  
9 converging towards a hole through the material, said  
10 outer surface being formed at least in part by a lattice  
11 of protuberances at the same relative positional  
12 arrangement as the recesses, wherein said section is  
13 formed as a parallelogram having two acute angles and two  
14 obtuse angles.

15

16 Preferably the acute angles are in the range 30 to 60  
17 degrees. Advantageously, the acute angles are at 45  
18 degrees.

19

20 Preferably the section has a length greater than its  
21 width. Preferably at least some of said recesses are of a  
22 substantially truncated conical form. Optionally, each  
23 recess comprises a wall which converges towards the hole,  
24 adjacent walls forming a peak between each recess,  
25 wherein a plurality of said peaks are located on a row  
26 lengthways on the inner surface having a height greater  
27 than that of adjacent peaks across the width of the inner  
28 surface.

29

30 Preferably the holes within the recesses are of various  
31 diameters over the width of the section. Advantageously  
32 also, protuberances may also have holes at their apex.

33

1 Preferably the material of the section is sufficiently  
2 flexible so that the section can be rolled into a  
3 cylindrical form and that the recesses and protuberances  
4 can overlap and locate within each other.  
5

6 Preferably the section is made of a plastic. More  
7 preferably the plastic is chosen to be easily moulded on  
8 a former. The plastic may be a recycled plastic such as  
9 HDPE obtained from domestic waste. Advantageously a  
10 pigment may be added to the plastic to colour the  
11 plastic. Preferably the plastic is dyed black.  
12

13 According to a third aspect of the present invention,  
14 there is provided a container for organic matter, the  
15 container comprising at least one section of flexible  
16 material, said inner surface being formed in part by a  
17 lattice of recesses, at least some of said recesses being  
18 of substantially truncated conical form having a wall  
19 which converges towards a hole through the section,  
20 adjacent walls forming a peak between each recess, a  
21 plurality of said peaks located on a row lengthways on  
22 the inner surface having a height greater than that of  
23 adjacent peaks across the width of the inner surface,  
24 said outer surface being formed in part by a lattice of  
25 protuberances at the same relative positional arrangement  
26 as the recesses, said section being a parallelogram  
27 arranged in a cylinder with its opposite ends overlapping  
28 and the protuberances on the outer surface of one end  
29 nesting within the recesses of the inner surface of the  
30 other end at the overlap, and a container base arranged  
31 to rest on said walls of said peaks of greater height and  
32 fastening means being provided to hold the section in  
33 said overlapping, nested engagement.  
34



1 Optionally the container may further comprise a lid  
2 arranged to rest on an upper edge of the flexible section  
3 of material. With the inclusion of a lid the container  
4 becomes suitable for retaining compost.  
5

6 Detailed Description of the Invention  
7

8 Embodiments of the present invention will now be  
9 described by way of example only with reference to the  
10 following Figures in which:  
11

12 Figure 1 is a schematic perspective view of a plant,  
13 according to a first embodiment of the present invention;  
14

15 Figure 2 is side elevation view of a section of material  
16 for making the container of Figure 1, according to a  
17 second embodiment of the present invention;  
18

19 Figure 3 is a perspective view of a portion of a section  
20 of material for making a container, according to an  
21 embodiment of the present invention;  
22

23 Figure 4 is a top view of a part of a container  
24 illustrating the overlapping portion;  
25

26 Figure 5 is a cross-sectional view of a container,  
27 including a plant according to a third embodiment of the  
28 present invention; and  
29

30 Figure 6 is a cross-sectional view of a compost container  
31 according to a fourth embodiment of the present  
32 invention.  
33

1 With reference to the embodiments of a plant growth  
2 container, it will be appreciated that the present  
3 invention is an improvement on the plant growth container  
4 as described in US 5,099,607 and US 4,939,865,  
5 accordingly these documents are incorporated herein by  
6 reference.

7  
8 Referring initially to Figure 1 of the drawings there is  
9 illustrated a plant container, generally indicated by  
10 reference numeral 10, in accordance with a first  
11 embodiment of the present invention. Container 10 is of  
12 substantially cylindrical shape. The container 10  
13 includes a joint 12 where a first end 14 and a second end  
14 16 of a section 18 making up the container 10, form an  
15 overlap 20. The ends 14,16 are held in the overlap 20 by  
16 two screws 22a,b. The joint 12 is diagonal across the  
17 height of the cylinder from a top edge 24 to a base edge  
18 26. The joint 12 thus forms a spiral or helix around a  
19 portion of the container 10.

20  
21 Reference is now made to Figure 2 of the drawings which  
22 shows section 18, before being rolled to form the  
23 cylinder of container 10. Section 18 is shaped as a  
24 parallelogram with the top and base edges, 24,26 forming  
25 one pair of parallel sides, and the ends 14,16 forming  
26 the second pair of parallel sides. This arrangement  
27 provides two acute angles 28a,b and two obtuse angles  
28 30a,b. Section 18 is preferably formed from a relatively  
29 thin plastic material which is rollable and bendable into  
30 a circular cylindrical container 10. The material is  
31 sufficiently rigid and strong so that when formed into an  
32 open topped container 10, the container 10 is self  
33 supporting and is able to be filled with organic matter,  
34 such as soil, humus or the like. The material may

1 advantageously be recycled plastic such as HDPE obtained  
2 from domestic waste making the section cheap to produce.  
3 Black pigments may be added to the plastic to produce a  
4 uniform colouring. In a preferred embodiment the plastic  
5 is biodegradable, such that the container may be planted  
6 in the ground when its contents are planted. This eases  
7 planting of the contents.

8

9 Section 18 further includes an inner surface 32 and an  
10 outer surface 36. Inner surface 32 forms the inner  
11 surface of the container 10, while outer surface 36 forms  
12 the outer surface of the container. Section 18 has been  
13 plastically distorted or contoured, preferably as it has  
14 passed through rollers having points on a forming  
15 machine. This provides a lattice of recesses 38  
16 uniformly across the inner surface 32. Holes 40 may be  
17 formed at the ends of the recesses 38, such that, in use,  
18 roots are guided towards the holes 40 so that air pruning  
19 will occur around the outer surface 36.

20

21 The lattice structure of recesses 38 is best seen with  
22 the aid of Figure 2, which illustrates a portion of the  
23 section 18. As can be seen from the Figure, the section  
24 has the classic structure of an egg box. The structure  
25 provides free flowing conical forms 42. Each form 42 has  
26 a point 44 which ensures there are no flat surfaces  
27 inside the container 10 which would deflect roots back  
28 into the root ball. The point 44 is typically sliced off  
29 to form a hole 40. It will be appreciated that the size  
30 of the hole can be varied by removing a greater or  
31 smaller section of the point 44. Between the recesses 38  
32 are walls 46. The walls 46 also are substantially conical  
33 in form an taper to provide the protuberances 48 on the  
34 outer surface 38 at points where the recesses 38 appear

1 on the inner surface 32. The walls 46 effectively form a  
2 peak 34 between the recesses 38.

3

4 At the overlap 20, the first end 14 and the second end 16  
5 are brought together so that respective recesses 38 and  
6 protuberances 48 can be engaged. This is done in the  
7 manner of stacking egg cartons. It will be appreciated  
8 that this simple interlocking arrangement of the ends  
9 14,16 of the section 18, can be used to stack multiple  
10 sections 18 together for ease of transportation and  
11 storage prior to containers 10 being assembled. Reference  
12 is now made to Figure 4 of the drawings which illustrates  
13 a cross-section through a portion of the section 18 at  
14 the overlap 20. The ends 14,16 are overlapped across two  
15 recesses 38, with the points 44 resting in the apex 50 of  
16 the protuberances 48. At one of the points 44, there is  
17 located a screw 52 which holds the two ends 14,16  
18 together. Though a screw 52 is illustrated an equivalent  
19 releasable fastening, such as a metal clip could be used.  
20 It will be appreciated that the number of screws 56  
21 required to hold the overlap 20 together is less than the  
22 number of holes 40 which will occur across the overlap  
23 20, and thus air root pruning will still be effective  
24 over this overlap 20. As illustrated in Figure 1 two  
25 screws 52 are typically used to secure the overlap 20. In  
26 this way a lower screw will hold the container 10 in a  
27 cylindrical form while the upper screw can be removed. On  
28 removing the upper screw the end 14 at the top edge 24  
29 can be peeled back and the contents either examined or  
30 removed, without the container 10 collapsing.

31

32 It will also be appreciated that the overlap 20 of the  
33 container comprises a greater number of  
34 recess/protuberance pairs than an equivalent container of

1 the same height with a vertical joint. The increased  
2 number of pairs is achieved without increasing the amount  
3 of material required to construct the container 10. The  
4 increased number of pairs provides a stronger joint. In  
5 the prior art, to achieve a greater overlap and thus a larger  
6 would have required a greater overlap and thus a larger  
7 section 18 of material for the same sized container.

8 Reference is now made to Figure 5 of the drawings which  
9 illustrates an open topped container, generally indicated  
10 by reference numeral 110, in accordance with a third  
11 embodiment of the present invention. Like parts to those  
12 of Figures 1 to 4 have been given the same reference  
13 numeral with the addition of 100. Container 110 supports  
14 plant 54 during transportation, while facilitating growth  
15 of the plant 54 within the container 110.

16 Container 110 comprises an inner surface 32 and an outer  
17 surface 36. The inner surface 32 is formed as a lattice,  
18 best seen in Figure 3, having route guiding recesses 38  
19 which are conical in cross-section. Each recess 38  
20 provides an equivalent protuberance 48 on the outer  
21 surface 36. Adjacent recesses 38a,b form a peak 34 on  
22 the inner surface 32 of the container 110. Each recess  
23 38 has a base 56, through which an aperture or hole 40  
24 may be formed. This can simply be done by slicing a  
25 portion from the outer surface.

26 As illustrated in Figure 5, there are ten rows 58 of  
27 recesses 38 arranged lengthways on the lattice across the  
28 width of the container 110. At an upper end of the  
29 container 60 the first row 58a has a recess 38 which does  
30 not have a hole. At a lower end 62 of container 110, two  
31 rows 58b,c have large holes in each of the bases 56. A  
32  
33  
34

1 large hole is defined as a hole where 20% to 40% of the  
2 area of the base 56 has been removed. This can be  
3 achieved by removing a larger section of the outer  
4 surface 36 at these points. The remaining rows each have  
5 recesses 38 which include holes 40 which are of a medium  
6 size. Medium size holes are those where 6% to 20% of the  
7 area of the base 56 has been removed. The chosen  
8 percentage of area to be removed will be dependent on the  
9 species of plant in the container and how secondary root  
10 formation is achieved.

11

12 Each peak 34 of the container 110 is of similar height,  
13 excepting that of the third row from the lower end 62 of  
14 the container 110. This peak 64 has a height at least  
15 twice the amplitude of the height of the remaining peaks.

16

17 Additionally the peaks 34 associated with the lower most  
18 rows 58b,c have had their apexes sliced to form an  
19 additional hole 66a,b. A combination of holes 40 in the  
20 bases 56 of the recesses 38 and the holes 66 in the peaks  
21 34 at the lower end 62 of the container 110 is referred  
22 to "double holing". Such double holing allows for a  
23 greater circulation of air around the lower end 62 of the  
24 container 110.

25

26 Container 110 further includes a base 68. Base 68 is a  
27 cylindrical disk inserted above the peak 64 which has the  
28 extended height. In the illustration shown in Figure 5,  
29 the base 68 has a diameter equivalent to the diameter of  
30 the container 110. However, it will be appreciated that  
31 peaks 64 could equally support a base of narrower  
32 diameter as long as the base 68 still rested on the wall  
33 70 of each peak 64. It will further be seen that the  
34 protuberance 72 of the peak 64 above the base 68 provides

1 a locking mechanism to ensure that the base 68 cannot  
2 ride up towards the upper end 60 of the container 110.

3

4 As is known in the art, base 68 may include a number of  
5 apertures to allow the air pruning of roots at the base  
6 or, alternatively, base 68 may be coated prior to  
7 insertion into the container 110 with a chemical growth  
8 retardant. Additionally base 68 may include a metal grid  
9 to provide reinforcement to the base. The base may also  
10 be made of a non-galvanised steel which is biodegradable  
11 so that it can be left in the ground when the plant is 54  
12 ready to be planted following transportation.

13

14 In use a section 118, which includes a row 58 of peaks 64  
15 which are greater in amplitude than adjacent peaks 74, is  
16 made into a cylinder by overlapping the ends 14,16 to  
17 interleave the recesses 38 and protuberances 48. The  
18 overlapping portion 20 is secured by screws 52 inserted  
19 via the holes 40. A base 68 can then be inserted from  
20 the upper end 60 of the container 110 to rest on the  
21 walls 70 of the heightened peaks 64. It will be  
22 appreciated that the base 68 may be inserted prior to the  
23 cylinder being formed by positioning the base 68 against  
24 the wall 70 and rolling the section 118 around the base  
25 68. Once fastened, the improved container 110 is  
26 complete. Thereafter, growing medium 78 can be inserted  
27 above the base 68 and a plant 54 can be positioned in the  
28 growing medium 78 and allowed to grow while being capable  
29 of being transported.

30

31 Advantages of this embodiment of the present  
32 invention are then apparent, in that the heightened peaks  
33 64 provide additional support to the base 68, so that  
34 plants of greater weight can be carried and that

1 containers 110 of greater diameter can be used. The  
2 holes 40 located adjacent to the growing medium 78  
3 provides for air pruning of the roots which are guided  
4 towards the recesses 38. At the upper end 60 of the  
5 container 110, the rows 58 of recesses 38 do not have  
6 holes. This allows the plant to be watered without the  
7 water being expelled out of holes at the top of the  
8 container which would be wasteful, and thus the watering  
9 medium will be dispersed through the root growing medium  
10 78. At the lower end 62 of the container 110 air root  
11 pruning is enhanced by the double holing of the section  
12 by providing holes both in the recesses 38 and the peaks  
13 34.

14  
15 Reference is now made to Figure 6 of the drawings which  
16 illustrates a compost container, generally indicated by  
17 reference numeral 210, according to a fourth embodiment  
18 of the present invention. Like parts to those in Figures  
19 1 to 5 have been given the same reference numeral with  
20 the addition of 200.

21  
22 Compost container 210 has a sides and a base identical to  
23 those described with reference to Figure 5. Container 210  
24 further includes a lid 80. Lid 80 has a substantially  
25 circular form with a lip 82 to engage with the upper end  
26 260 of the cylindrical section of material.  
27 Advantageously the lid 80 has a raised centre portion 84  
28 and has a number of apertures 86 which allow for the  
29 circulation of air to the waste matter 88 decomposing  
30 within the container 210. A handle 90 is included on the  
31 lid for ease of use.

32  
33 A principal advantage of the compost container is that it  
34 is easily assembled and transportable while still



1 permitting a good circulation of air to the waste matter.  
2 Thus the container is easily portable and can be  
3 repositioned to take advantage of sunnier positions in  
4 use.

5  
6 The principal advantage of the present invention is that  
7 it provides a container for organic matter and the  
8 transportation of plants which is quick to assemble,  
9 reusable, has a strong joint and on which the contents of  
10 the container can be inspected.

11  
12 A further advantage of an embodiment of the present  
13 invention is that it provides a container for  
14 transporting plants which can carry substantial weights  
15 due to the strength of the joint and the support for a  
16 base.

17  
18 Modifications may be made to the invention described  
19 hereinbefore, without departing from the scope thereof.  
20 For instance, in the plant root container, the recesses  
21 may have any wall shape as long as they guide the root  
22 towards a hole or aperture. Any fastening means may be  
23 used, such as the clip described in GB2350272 or,  
24 alternatively, rivets may be used in place of the screws.  
25 Preference of course would be to the use of screws so  
26 that the structure can be disassembled and re-used again.  
27 Additionally while only a single section container has  
28 been described, it will be recognised by those skilled in  
29 the art that larger diameter containers may be  
30 constructed from a number of sections by overlapping  
31 adjacent ends. These will provide a distributed  
32 strengthening around the container, while permitting more  
33 than one access point for inspection.

34